CLAIMS

What is claimed is:

1. An apparatus for capturing an analyte comprising:

an electrophoresis cassette including:

a base having a pair of electrode channels, a barrier interposed between the electrode channels, the barrier having at least one migration channel extending between the electrode channels, an enlarged slot bounded and opening into the migration channel;

a first electrode extending in the first electrode channel; and

a second electrode extending in the second electrode channel; and

a capture gel holder receivable in the enlarged slot, the capture gel holder having an opening aligned with the migration channel.

2. The apparatus of claim 1 wherein the barrier has a second enlarged slot bounded and opening into the migration channel for receiving the capture gel holder.

3. The apparatus of claim 2 further comprising an evaporation cover for overlying the electrophoresis cassette, the evaporation cover having at least one opening for the capture gel holder and at least one opening for venting of gas.

4. The apparatus of claim 3 wherein the electrophoresis cassette includes at least one wash well.

5. The apparatus of claim 3 wherein at least one of the electrodes has a pair of terminals that extend through the evaporation cover and are flush with the top of the evaporation cover.

6. The apparatus of claim 3 wherein the capture gel holder has a plurality of teeth, each tooth having an opening for receiving non-conductive polymeric mesh and the teeth having a polarity device so that the teeth fit in the enlarged slot of the electrophoresis cassette in a certain manner.

7. The apparatus of claim 4 wherein the gel capture holder has a plurality of teeth, each tooth having an opening for receiving non-conductive polymeric mesh and the teeth having a polarity device so that the teeth fit through the at least one opening of the evaporation cover.

8. An apparatus for capturing an analyte comprising:

an electrophoresis cassette including:

a base having a pair of electrode channels, a barrier interposed between the electrode channels, the barrier having at least one migration channel extending between the electrode channels, an enlarged slot bounded and opening into the migration channel;

a first electrode extending in the first electrode channel; and

a second electrode extending in the second electrode channel;

a capture gel holder receivable in the enlarged slot, the capture gel holder having an opening aligned with the migration channel;

a thin gel carried in the opening of the capture gel holder, the thin gel having a gel matrix and a ligand covalently bound to the gel matrix.

9. The apparatus of claim 8 wherein the thin gel further comprising a non-conductive polymeric mesh for linking with the gel matrix.

10. The apparatus of claim 9 wherein the barrier has a second enlarged slot bounded and opening into the migration channel for receiving the capture gel holder.

11. The apparatus of claim 10 further comprising an evaporation cover for overlying the electrophoresis cassette, the evaporation cover having at least one opening for the capture gel holder and at least one opening for venting of gas.

12. The apparatus of claim 11 wherein the electrophoresis cassette includes at least one wash well.

13. The apparatus of claim 11 wherein at least one of the electrodes has a pair of terminals that extend through the evaporation cover and are flush with the top of the evaporation cover.

14. The apparatus of claim 11 wherein the capture gel holder has a plurality of teeth, each tooth having an opening for receiving non-conductive polymeric mesh and the teeth having a polarity device so that the teeth fit in the enlarged slot of the electrophoresis cassette in a certain manner.

15. The apparatus of claim 14 wherein the capture gel holder further comprises a detection surface.

16. The apparatus of claim 11 wherein the gel capture holder has a plurality of teeth, each tooth having an opening for receiving non-conductive polymeric mesh and the teeth having a polarity device so that the teeth fit through the at least one opening of the evaporation cover.

17. A capture gel holder comprising:

a handle;

a plurality of teeth projecting from the handle, at least one of the teeth having a bore through the tooth; and

a gel matrix and a ligand covalently bound to the gel matrix overlying the bore.

18. The capture gel holder of claim 17 wherein at least one tooth having a keyed shaped therein adapted to fit in the electrophoresis cassette in only in a specific direction.

19. The capture gel holder of claim 18 wherein each of the teeth has a recessed central region around the bore and a flange on the bore wherein the recessed region and the flange are to facilitate the release of gas.

20. The capture gel holder of claim 19 further comprising a non-conductive polymeric material overlying each bore of the teeth and for supporting the gel matrix and ligand.

21. The capture gel holder of claim 20 wherein the keyed shape includes each tooth having a curved edge and a flat edge adapted to be fit in the electrophoresis cassette only in a specific direction.

22. The capture gel holder of claim 21 wherein the keyed shape includes one tooth having a protrusion adapted to pass through only a specific slot in an evaporative cover of an electrophoresis cassette.

23. The apparatus of claim 21 wherein the capture gel holder further comprises a detection surface.

24. The apparatus of claim 20 wherein the keyed shape includes one tooth having a protrusion adapted to pass through only a specific slot in an evaporative cover of an electrophoresis cassette.

25. A thin gel for capturing an analyte by electrophoresis comprising:

a gel matrix and a ligand covalently bound to the gel matrix.

26. The thin gel of claim 25 wherein the gel matrix has a tensile strength sufficient to allow removal from the electrophoresis device.

27. The thin gel of claim 25 further comprising a non-conductive polymeric material.

28. The thin gel of claim 27 wherein the non-conductive polymeric material is selected from the group consisting of a mesh, a mat, a woven fabric, and a felt.

29. The thin gel of claim 27 wherein the non-conductive polymeric material is a polymer capable of cross-linking the gel matrix.

30. An apparatus for capturing an analyte, the apparatus comprising:

a gel matrix and a ligand covalently bound to the gel matrix.

31. The apparatus of claim 30 further comprising a non-conductive polymeric material for supporting the gel matrix and ligand.

32. The apparatus of claim 31 further comprising a capture gel holder having a plurality of openings for receiving the non-conductive polymeric material.

33. The apparatus of claim 32 further comprising an electrophoresis cassette for receiving a gel for electrophoresis and capturing an analyte, the electrophoresis cassette includes

a base having a pair of electrode channels, and a barrier interposed between the electrode channels, the barrier having at least one migration channel

extending between the electrode channels; and an enlarged slot bounded and opening into the migration channel for receiving the capture gel holder;

a first electrode extending in the first electrode channel; and

a second electrode extending in the second electrode channel.

34. The apparatus of claim 33 wherein the barrier has a second enlarged slot bounded and opening into the migration channel for receiving the capture gel holder.

35. A method of capturing a target molecule contained in a sample, the method comprising the steps of:

providing a non-conductive polymeric material having a gel matrix comprising a covalently bound ligand specific for the target molecule; and

passing the sample through the non-conductive polymeric material having the gel matrix such that the target molecule is captured by the capture probe of the gel matrix and the remainder of the sample passes through the non-conductive polymeric material.

36. The method of claim 35 wherein the target molecule is detectably labeled prior to passing the sample through the gel matrix.

37. The method of capturing of the target molecule of claim 29 further comprising the steps of:

providing an electrophoresis cassette having a migration channel extending between a pair of electrode channels each having an electrode;

providing an electrophoretic matrix in the electrophoresis cassette and forming a sample-well to receive the sample within the migration channel;

inserting the non-conductive polymeric material having the gel matrix comprising the covalently bound ligand which is carried by a capture gel holder into the migration channel by placing the capture gel holder into an enlarged slot which bounds and opens into the migration channel;

inserting the sample with the target molecule in the sample well;

passing a voltage in the electrophoresis cassette to cause the sample to migrate in the channel from the sample well towards the non-conductive polymeric material.

38. The method of claim 37 further comprising the steps of:

removing the capture gel holder from the electrophoresis cassette; and

placing the capture gel holder in a reader to detect a probe associated with the analyte.

39. The method of claim 38 wherein the electrophoresis cassette has a second enlarged slot for a respective migration channel for receiving the capture gel holder.

40. The method of claim 37 further comprising the steps of:

removing the capture gel holder from the electrophoresis cassette; and

subjecting the capture gel holder to conditions sufficient to break the bond between the capture probe and the target molecule.

41. The method of claim 40 wherein the electrophoresis cassette has a second enlarged slot for a respective migration channel for receiving the capture gel holder.

42. A method of detecting a target molecule comprising the steps of:

providing a capture gel holder having a non-conductive polymeric material having a gel matrix comprising a covalently bound ligand;

providing an electrophoresis cassette having a migration channel extending between a pair of electrodes and a sample well to receive the sample within the migration channel and a pair of enlarged slots bounding and opening into the migration channel;

inserting the sample with the target molecule in the sample well;

inserting the capture gel holder into one of the pair of enlarged slots in the migration channel;

passing a voltage in the electrophoresis cassette to cause the sample to migrate in the migration channel from the sample well towards the non-conductive polymeric material;

removing the capture gel holder from the electrophoresis cassette; and

placing the capture gel holder in a reader to detect a probe associated with the analyte.

43. The method of claim 42 further comprising the steps of:

preparing the sample including having a reporter probe to adhere to the target molecule;

stopping the voltage in the electrophoresis cassette;

moving the capture gel holder to a wash station

inserting the capture gel holder into the other enlarged slot in the migration channel; and

passing a voltage through the electrophoretic matrix in the electrophoresis cassette to cause the sample to migrate in the channel from the sample well away from the capture gel holder and the non-conductive polymeric material.

44. A method for performing an analyte ligand binding assay, said method comprising the steps of:

a.) providing an electrophoresis cassette having

a base unit having a pair of electrode channels, a barrier interposed between the electrode channels, the barrier having at least one migration channel extending between the electrode channels; and an enlarged slot bounded and opening into the migration channel for receiving the capture gel holder;

a first electrode extending in the first electrode channel;

a second electrode extending in the second electrode channel;

a sample-well forming comb removable seated in the migration channel; and

a thin gel having a gel matrix and a ligand covalently bound to the gel matrix and placed in the migration channel;

b.) filling the apparatus with a gel for electrophoresis;

c.) allowing the gel to solidify;

d.) removing the comb to thereby create a sample well;

e.) placing a sample in the sample well;

f.) providing an electromotive force; and

g.) moving the sample through said thin gel with said electromotive force.

45. The method of claim 44 further including the step of providing a detection probe in said sample well.

46. The method of claim 44 further including the steps of: g.) removing said thin gel from said apparatus and h.) detecting the presence or absence of said detection probe.

47. The method of claim 46 further including the step of washing said thin gel between steps g.) and h.).

48. An apparatus for capturing a target molecular comprising:

a housing having:

a base having a first electrode channel, a second electrode channel, a barrier interposed between the first electrode channels and the second electrode channel, the barrier having at least one migration channel extending between the first electrode channels and the second electrode channel, an enlarged slot bounded and opening into a the migration channel;

a slot, the capture gel holder having an opening aligned with the migration channel; and

a gel carried in the opening of the capture gel holder, the thin gel having a gel matrix and a ligand covalently bound to the gel matrix.

49. The apparatus of claim 48, wherein said apparatus further comprises a first electrode extending in the first electrode channel and a second electrode extending in the second electrode channel.

50. The apparatus of claim 48 wherein the gel further comprises a non-conductive polymeric mesh for linking with the gel matrix.

51. The apparatus of claim 50 wherein the barrier has a second enlarged slot bounded by and opening into the migration channel for receiving the capture gel holder.

52. The apparatus of claim 51 further comprising an evaporation cover for overlying the electrophoresis cassette, the evaporation cover having at least one opening for the capture gel holder and at least one opening for venting of gas.

53. The apparatus of claim 52 wherein the electrophoresis cassette includes at least one wash well.

54. The apparatus of claim 52 wherein at least one of the electrodes has a pair of terminals that extend through the evaporation cover and are flush with the top of the evaporation cover.

55. The apparatus of claim 52 wherein the capture gel holder has a plurality of teeth, the teeth having a polarity device so that the teeth fit in the enlarged slot of the electrophoresis cassette in a certain manner.

56. A capture gel holder comprising:
a handle;
a plurality of teeth projecting from the handle, at least one of the teeth having a bore through the tooth; and
a gel matrix overlying the bore.

57. The capture gel holder of claim 56 wherein at least one tooth has a keyed shaped to permit placement therein adapted to fit in the electrophoresis cassette in only in a specific direction.

58. The capture gel holder of claim 57 wherein each of the teeth has a recessed central region around the bore and a flange on the bore wherein the recessed region and the flange are capable of facilitating release of gas.

59. The capture gel holder of claim 58 further comprising a non-conductive polymeric material overlying each bore of the teeth and for supporting the gel matrix and ligand.

60. The capture gel holder of claim 59 wherein the keyed shape includes each tooth having a curved edge and a flat edge adapted to be fit in the electrophoresis cassette only in a specific direction.

61. The capture gel holder of claim 60 wherein the keyed shape includes one tooth having a protrusion adapted to pass through only a specific slot in an evaporative cover of an electrophoresis cassette.

62. The apparatus of claim 60 wherein the capture gel holder further comprises a detection surface.

63. The apparatus of claim 59 wherein the keyed shape includes one tooth having a protrusion adapted to pass through only a specific slot in an evaporative cover of an electrophoresis cassette.

64. A gel for capturing an analyte by electrophoresis comprising:
a gel matrix and a ligand covalently bound to the gel matrix.

65. The gel of claim 64 wherein the gel matrix has a tensile strength sufficient to allow removal from the electrophoresis device.

66. The gel of claim 64 further comprising a non-conductive polymeric material.